Efficiency Standards Office

Blueprint

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California Energy Commission

RESIDENTIAL STANDARDS

Questions and Answers

Q ***Is the Commission going to produce a list of water heaters that don't need an R-12 wrap to comply with the 1992 standards?***

No. There are two reasons why such a list is no longer necessary. First, an energy factor number has replaced the multiple variations of recovery efficiency, standby loss and rated input which used to make equivalency comparisons complicated. Second, under the previous standards, prescriptive compliance, point system, and some computer programs required an R-12 wrap. The current compliance methods can demonstrate compliance (DHW-1, points, and computer modeling) without this wrap.

Q ***What can I do if the energy calculations indicate that an R-12 wrap is required but the unit specified cannot be wrapped without voiding the warranty?***

If possible, calculations should be redone without the R-12 wrap. For points compliance, this results in -2 or more points and for computer compliance, the effect can increase the proposed energy use by 3 - 4 kBtu/ft^2 for a single water heater.

If recalculating compliance is not feasible, a **gas water heater** with the listed energy factor (EF) can be installed without an R-12 external wrap (interpolation is allowed).*

If the CF-1R shows:	Install Gas:
Standard Gas	≥ 0.59 EF
≤ 50 gallons, R-12 external insulation, with	
≤ 0.53 EF	≥ 0.59 EF
≤ 0.55 EF	≥ 0.60 EF
≤ 0.56 EF	≥ 0.63 EF
≤ 0.58 EF	≥ 0.65 EF
≤ 0.60 EF	≥ 0.68 EF
≤ 0.63 EF	≥ 0.72 EF
> 50 ≤ 75 gallons, R-12 external insulation, with	
≤ 0.48 EF	≥ 0.54 EF
≤ 0.53 EF	≥ 0.61 EF
≤ 0.58 EF	≥ 0.67 EF

For dwellings of 1,000 square feet or more only:

If the CF-1R shows:	Install Gas:
Two water heaters ≤ 50 gallons, R-12 external insulation, with	
≤ 0.53 EF	≥ 0.59 EF
≤ 0.55 EF	≥ 0.61 EF
≤ 0.56 EF	≥ 0.63 EF
≤ 0.58 EF	≥ 0.66 EF
≤ 0.60 EF	≥ 0.69 EF
≤ 0.62 EF	≥ 0.72 EF
≤ 0.63 EF	≥ 0.73 EF

Q ***Am I exempt from the requirement for a setback thermostat if I have a gravity wall heater or any of the equipment types listed in the exception to Section 150(i)?***

Exemption from the requirement depends on the compliance approach you are using. The latter part of the exception indicates that

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*Conservative estimates of equivalency, assuming a standard distribution system.

"the resulting increase in energy use due to the elimination of the setback thermostat shall be factored into the compliance analysis." The only compliance approach which can model this condition is the computer performance compliance approach. To be exempt from the setback thermostat requirement, the building/space must be modeled with "non-setback." Any time the point system or alternative component packages are used for compliance, a setback thermostat is required, regardless of the type of heating/cooling system (except wood stoves).

Q ***How can I tell if a window is site built or manufactured?***

If the window has a label indicating a U-value based on either the "CEC Default" or an "NFRC Rating Procedure," the window is a manufactured fenestration product. If it does not have such a label, it is considered site built for purposes of compliance with the ***Energy Efficiency Standards*** .

Q ***What are the differences between total conditioned floor area, ground floor area, slab-on-grade area, and conditioned footprint? Why are there various designations of square footage?***

Each of these floor area designations is used for a different purpose. Total *conditioned floor area* (CFA) is the total square feet in the building, including upper stories; CFA is used to calculate the energy budgets and water heating budgets which are expressed as kBtu/ square foot of conditioned floor area.

Ground floor area, slab-on-grade area and *conditioned footprint* are used in determining thermal mass requirements. The *conditioned footprint* is used to determine if a building with mixed floor types is raised floor or slab on grade. If more than 50 percent of the conditioned footprint area is slab-on-grade construction, the building is slab-on-grade construction. The footprint area may be the area of the first floor, but will also include any projections of upper stories over unconditioned space. The footprint can be likened to an aerial (or plan) view of the areas that are conditioned. For example, if there is a bedroom over the garage of a second floor, the conditioned footprint is equal to the square footage of the first floor plus the square footage of the bedroom over the garage.

A raised floor building's thermal mass requirement is based on 5 percent of the *ground floor area* being exposed mass (although actual exposed mass is likely brick or tile); a slab-on-grade building's thermal mass requirements is based on 20 percent of the *slab-on-grade area* being exposed mass.

Q ***Can you please explain the criteria for installing loose fill insulation—the Residential Manual contains considerably more information than the Energy Efficiency Standards (Section 150(b)), which only require that the installation conform to manufacturer's specifications for achieving the labeled R-value?***

The three criteria to consider are: (1) roof slope, (2) ceiling slope, and (3) clearance. All of the criteria are recommendations to ensure even distribution and that insulation installed on a sloped surface doesn't settle to the extent that it becomes ineffective as a barrier between the conditioned and unconditioned space.

(1) For a fairly typical situation where the ceiling is flat and the *roof is sloped*, the recommendation is that the roof slope be a *at least* 2-1/2-foot rise in a 12-foot run, but the slope can be greater. This is to allow enough room between the ceiling and roof for sufficient insulation thickness.
(2) If the *ceiling is sloped*, loose fill can be used if the slope is *no more than* a 6-foot rise in a 12-foot run and manufacturer's restrictions are not exceeded. If, however, the ceiling slope is steep (greater than 6 in 12 feet), you should not use loose fill insulation.
(3) The recommendation of a 30-inch *clearance* from the top of the bottom chord of the

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truss or ceiling joists to the underside of the roof sheathing is to facilitate installation and inspection.

Q ***In defining the living and sleeping zones for a home with a zonally controlled HVAC system, can laundry rooms and bathrooms (which are not habitable spaces) be included on whichever zone they are most suited to geographically (e.g., a bathroom located near bedrooms)?***

Yes. For computer modeling, include the square footage of any nonhabitable or indirectly conditioned spaces with the closest zone.

NONRESIDENTIAL STANDARDS

Questions and Answers

Q ***Can I use gas absorption chillers (or any other type of equipment not regulated by the Appliance Efficiency Regulations) and still be in compliance with the building Energy Efficiency Standards?***

Yes. The ***Energy Efficiency Standards*** (Sections 110-111) require certification to any "applicable" appliance standards. For some types of equipment the ***Energy Efficiency Standards*** (Section 112) contain minimum efficiency requirements. And for other types of equipment there are no efficiency requirements.

Q ***If a gas absorption chiller (or other equipment not regulated by the Appliance Efficiency Regulations) is proposed for a building, can I get efficiency information from the Commission? Are there any limitations with either the prescriptive or performance approach?***

Efficiency information should be obtained from the manufacturer. The Commission may have information where a manufacturer has voluntarily listed their equipment.

(***Energy Efficiency Standards*** , Section 144) does not require a minimum efficiency, so no efficiency information is required beyond verifying certification, if applicable.

In the performance compliance approach (***Energy Efficiency Standards*** , Section 141) the program determines the energy budget (standard design) by modeling one of five specific types of HVAC systems, based on the building type (residential, nonresidential, etc.), heating fuel source, and number of zones served by the system. The program's calculational engine will limit the types of equipment that can be modeled for the proposed design. If the equipment type can be modeled, one of five standard HVAC system types will be assumed in determining the energy budget/standard design.

You should consult the program users' manual for modeling instructions for the proposed equipment type. If there are no instructions in the user's manual, a program vendor must propose an optional capability to model new or different HVAC equipment or systems. This optional capability must receive approval from the Commission. Until such a method is approved, the equipment cannot be modeled using a performance compliance approach.

Q ***Can I install one automatic time switch (ATS) control device override control in a 5,000 square foot space and be in compliance with the shut-off requirements of Section 131(d), or do I need an override control in each area enclosed by ceiling-height partitions?***

If the ATS device and override controls are installed to meet only shut-off requirements, each area with ceiling-height partitions does not have to have an individual override control. However, if the override control is also being installed to meet the "bi-level illumination" requirements of ***Energy Efficiency Standards*** , Section 131(b), each area with a ceiling-height partition must have an override control (Exception No. 3).

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If the override is installed to comply with shut-off control requirements only, although there is no requirement for a separate override control in each room, there are some requirements to consider other than the 5,000 ft^2 maximum area. [The 5,000 ft^2 maximum is increasing for some occupancies effective July 1, 1995—see ***Blueprint*** No. 49 (Summer 1994).] The Standards (Section 131(d)2.A.-E.) require that the override control be installed so that it can be reached quickly ("readily accessible"), and the person activating the override switch can either see the lights being controlled or the device visually signals that the lights are on or off in a given space ("annunciation").

Q ***Can I use an occupancy sensor to meet all of the interior lighting control requirements of the Standards (Section 131)? If so, would one occupancy sensing device on each floor of the building be adequate?***

Occupancy sensing devices will satisfy the requirements of Sections 131(a), (b), and (d), but not (c) unless there is also a manual switch in series with the occupancy sensor.

Area controls (Section 131(a)) require that each area enclosed by ceiling-height partitions have an independent control; spaces with occupancy sensing devices do not have to meet Section 131(b); and shut-off controls requirements (Section 131(d)) for buildings with 5,000 square feet or more can be met if the device also meets Section 119. The installation must be "in accordance with manufacturer's instructions" (Section 119(h)). When properly installed, the device must be able to sense occupancy in all spaces or rooms that are being controlled, which will require multiple sensors to prevent lights from going out while the building is still occupied. Occupancy sensing devices do not satisfy the requirement for separate switching within a daylit area (Section 131(c)) — occupants must be able to reduce the lighting level when there is adequate daylight available.

Q ***occupancy sensor (Section 146(a)2) if it is also being used to satisfy mandatory requirements for room switching and bi-level illumination?***

Yes.

Q ***One of the performance (computer) options for showing compliance for nonresidential additions and alterations is to show that the entire building meets the energy budget that would apply if the permitted space complied and the remainder of the building was unchanged (Energy Efficiency Standards, Sections 149(a)2.B.2. and (b)2.B.ii.). Can you explain what this means and the process for showing compliance?***

This process involves four steps and three separate computer runs:

1. Model the building before any alterations or additions to determine the energy use (proposed design) of the existing building.
2. Model the new or altered space to determine the energy budget (standard design) of the alteration or addition alone.
3. Calculate the energy budget for the *entire building* as:

$$\frac{(A_e \times PD_e) + (A_a \times SD_a)}{A_{e+a}} = \text{Energy Use Goal}$$

   A_e = Area of the existing entire building before the proposed addition/ alteration (from #1 above)
   PD_e = Proposed design of the existing entire building before the proposed addition/alteration (from #1 above)
   A_a = Area of the proposed addition/ alteration (from #2 above)
   SD_a = Standard design for the proposed addition/alteration (from #2 above)
   A_{e+a} = Area of the entire building after the proposed addition/ alteration

4. Model the entire building, including the proposed addition/alteration, along with

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any improvements to the existing building. If the proposed design is less than or equal to the energy use goal (from #3), the addition or alteration complies.

For example, 5,000 ft^2 of an existing 20,000 ft^2 building is being altered. In step #1, computer modeling shows that the existing building uses 25.4 kBtu/ft^2. In step #2, computer modeling shows that the proposed alteration's energy budget is 14.2 kBtu/ft^2.

Calculate the energy use goal as:

$$\frac{(15{,}000 \times 25.4) + (5{,}000 \times 14.2)}{(15{,}000 + 5{,}000)} = 22.6$$

22.6 kBtu/ft ^{2} energy use goal

If the proposed 5,000 ft^2 construction was an addition to the 20,000 ft^2 existing building, the calculated energy use goal would be:

$$\frac{(20{,}000 \times 25.4) + (5{,}000 \times 14.2)}{(20{,}000 + 5{,}000)} = 23.16$$

23.16 kBtu/ft ^{2} energy use goal

Q ***If I am using the ENV-3 form for metal framed assemblies from the 1992 Nonresidential Manual, should I be using different framing factors than those on the form? If so, what values should I be using?***

You should be using the framing factors from Appendix B, Table B-4, ***Nonresidential Manual*** , p. B-31). The values on the form are incorrect.

DID YOU KNOW?

Computer Programs to Assist Compliance

• • • **Equipment Finder** is a computer version of the Commission's Certified Appliance Directories. It is available to assist in the selection of heating, cooling, water heating and refrigeration equipment for easy-to-use searching and sorting features which enable you to find equipment without using the printed directories. Equipment Finder is available for $50 plus tax from:

Enercomp, Inc.
1851 Heritage Lane, Suite 187
Sacramento, CA 95815
(800) 755-5908

Program updates (approximately every six months) are available for $35.

• • • A new version of **EZFRAME** (v. 2.0) is available for demonstrating compliance with the envelope requirements of the residential and nonresidential ***Energy Efficiency Standards*** . Use of this program is voluntary. The new version contains several enhancements, including on-line help, a library of assembly layers, and a more user-friendly file interface (i.e., lists existing files, dialog boxes to prevent overwriting an existing file or discarding unsaved information). Version 1.0 will be decertified on February 1, 1995. Anyone who purchased Version 1.0 from the Commission's publications office will automatically receive Version 2.0 at no cost. If you do not currently have EZFRAME, you can order by sending a check for $14 and requesting P400-94-002R.

• • • A new version of **COMPLY 24** (Version 4.2) was approved by the Commission on January 4, 1995 (Versions 4.2 and 4.1 are valid for compliance with the ***Energy Efficiency Standards***). Version 4.2 can model evaporative cooling in nonresidential occupancies, and uses **DOE 2.1E** as its engine.

Publications

• • • The second edition of ***Advanced Lighting Guidelines*** is available from the Commission (P400-93-014, $10). This document was developed by the Commission, Electric Power Research Institute and Department of Energy. The Guidelines provide an overview of energy efficient lighting and product technologies, design applications, and current lighting products.

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• • • You can now order the most recent appliance directories om the Energy Commission. These include the ***Directory of ertified*** . . .

- Pool Heaters (P400-92-015, $2.00)
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